FEDERAL - STATE - PRIVATE
COOPERATIVE SNOW SURVEYS

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

and

FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
MAR. 1, 1970

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Mast af the usable water in western states ariginates as mauntain snowfall. This snawfall accumulates during the winter and spring, several manths befare the snaw melts and appears as streamflow. Since the runaff from precipitatian as snaw is delayed, estimates af snawmelt runaff can be made well in advance of its occurrence. Streamflaw farecasts published in this repart are based principally an measurement af the water equivalent af the mountain snawpack.

Farecasts become mare accurate as mare af the data affecting runaff are measured. All farecasts assume that climatic factars during the remainder af the snaw accumulatian and melt seasan will interact with a resultant average effect an runaff. Early seasan farecasts are therefore subject ta a greater change than thase made an later dates.

The snaw course measurement is abtained by sampling snaw depth and water equivolent at surveyed and marked lacatians in mauntoin areas. A total af abaut ten samples are taken at each lacatian. The averoge af these are reparted as snaw depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made manthly or semi-manthly fram January 1 thraugh June 1 in most states. There are abaut 1400 snaw caurses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that autamatic snaw water equivalent sensing devices alang with radia telemetry will provide a continuaus recard af snaw water equivalent at key lacations.

Detailed data an snaw caurse and soil moisture measurements are presented in state and lacal reparts. Other data an reservair starage, summaries af precipitatian, current streamflow, and sail maisture conditions at valley elevations are also included. The repart for Western United States presents a braad picture of water supply autlaak canditians, including selected streamflaw farecasts, summary af snaw accumulatian ta date, and starage in larger reservairs.

Snaw survey and sail maisture data for the periad af recard are published by the Sail Canservation Service by states abaut every five years. Data far the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Canservation Service publishes reparts fallowing the principal snaw survey dates from January 1 thraugh June 1 in coaperatian with state water administratars, agricultural experiment statians and athers. Capies of the reports far Western United States and all state reparts may be abtained fram Soil Canservation Service, Western Regianal Technical Service Center, Raam 209, 701 N. W. Glisan, Partland, Oregan 97209.

Capies af state and lacal reparts may alsa be abtoined from state offices of the Sail Canservation Service in the fallowing states:

STATE	ADDRESS
Alaska	P. O. Bax "F", Palmer, Alaska 99645
Arizana	6029 Federal Building, Phaenix, Arizana 85025
Calarada (N. Mex.)	12417 Federal Building, Denver, Calaradc 80202
Idaha	Raam 345, 304 N. 8th. St., Baise, Idaho 83702
Mantana	P. O. Bax 98, Bazeman, Mantana 59715
Nevada	P. O. Box 4850, Rena Nevada 89505
Oregan	1218 S. W. Washingtan St., Partland, Oregan 97205
Utah	4012 Federal Building, Salt Lake City, Utah 84111
Washington	360 U.S. Caurt Hause, Spokane, Washingtan 99201
Wyaming	P. O. Bax 340, Casper, Wyaming 82601

PUBLISHED BY OTHER AGENCIES.

Water Supply Outloak reports prepared by ather agencies include a repart far Califarnio by the Water Supply Farecast and Snaw Surveys Unit, Califarnia Department af Water Resaurces, P O Bax 388, Sacramenta, Califarnia 95802 --- and far British Columbia by the Department af Lands, Farests and Water Resources, Water Resaurces Service, Parliament Building, Victaria, British Columbia

USDA SCS-PORTLAND, OREG. 1966

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

ISSUED

MARCH 1, 1970

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

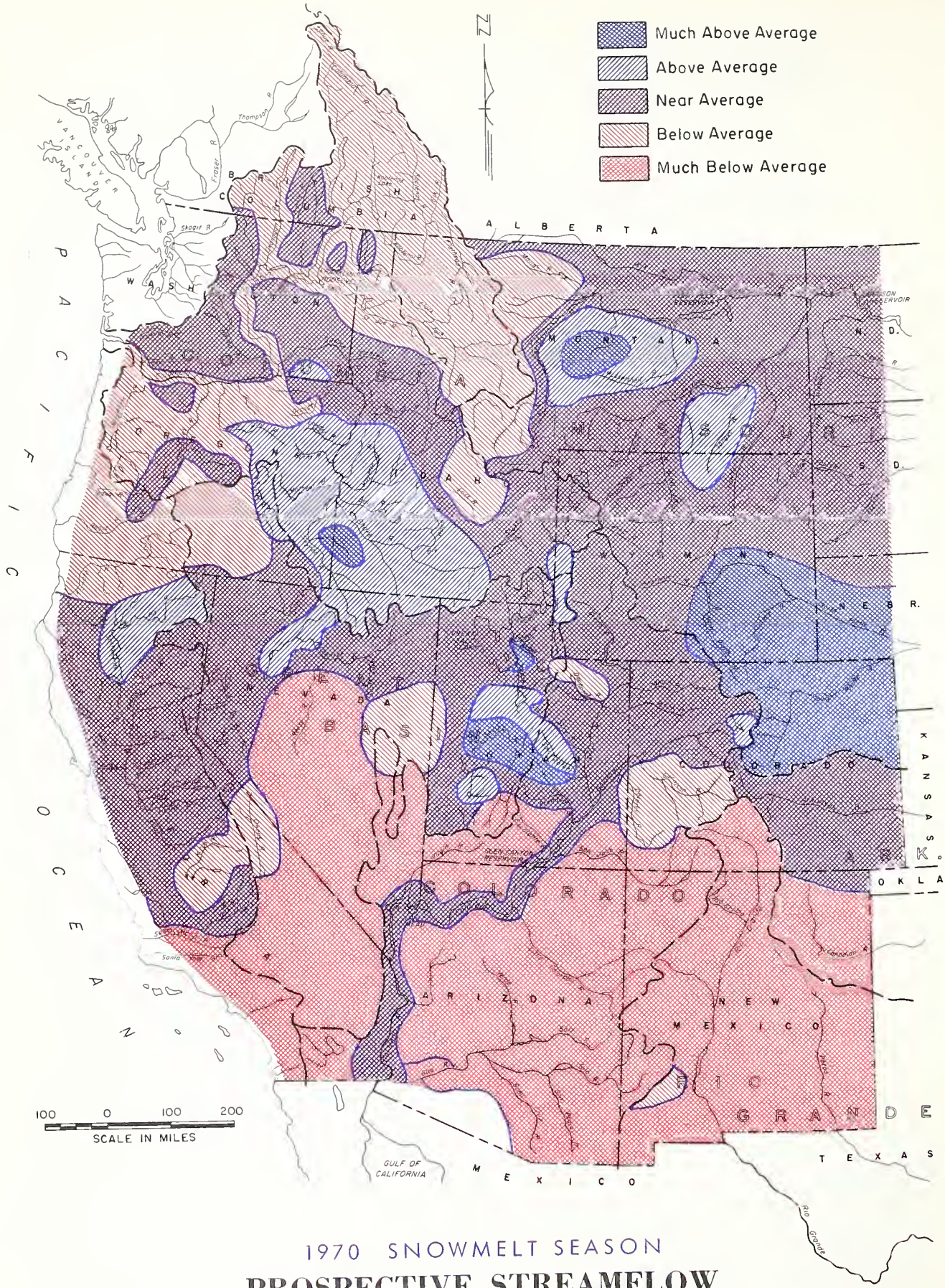
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENNETH E. GRANT, ADMINISTRATOR



1970 SNOWMELT SEASON

PROSPECTIVE STREAMFLOW

AS OF MARCH 1, 1970

USDA-SCS-PORTLAND, OREG. 1968

WATER SUPPLY OUTLOOK

1970 SNOWMELT SEASON
AS OF MARCH 1, 1970

STREAMFLOW PROSPECTS, WHEN COMBINED WITH GENERALLY EXCELLENT RESERVOIR STORED WATER, STILL PROVIDE A SATISFACTORY WATER SUPPLY OUTLOOK FOR MOST MAJOR IRRIGATED AREAS. WATER USERS WHO ARE ON NATURAL FLOW RIGHTS OR HAVE INADEQUATE RESERVOIR STORAGE RIGHTS CAN EXPECT LATE SUMMER SHORTAGES IN NEW MEXICO, ARIZONA, SOUTHWESTERN COLORADO, EXTREME SOUTHERN UTAH, CENTRAL AND SOUTHERN NEVADA. STREAMS HERE ARE FORECAST TO YIELD ABOUT 25 TO 65 PERCENT RUNOFF.

February weather was generally very dry and warm throughout the western snow survey states. This has resulted in lowered streamflow prospects for next summer. However, the near or above normal snowpacks of last month, when combined with the excellent reservoir storage water carried over from last year's favorable runoff, has been sufficient to soften this month's adverse effects so that adequate water supplies will still be available for most water users.

Temperatures of the past month have continued the generally warm trend of the winter, with many areas now showing four consecutive months of above normal temperature. This condition has not only removed or greatly reduced low elevation snow cover prematurely, but it has also increased the density of the intermediate and higher elevation snows to the point that the pack is ripening a month or more before it usually does. Unless a period of cooler temperatures sets in during the spring months, runoff can be expected early this year. Early runoff would be unfortunate, since streamflow would then recede earlier in the summer, accentuating water shortage problems in areas already susceptible to them.

The California Department of Water Resources reports that despite a dry, warm February, which has resulted in a reduction of forecasts reported last month by up to 15 percent, spring runoff of most Central Valley snowmelt streams is forecasted to be near normal. Aggregate storage in the State's major reservoirs is much above normal for this date. Southern California, with runoff to date only 50 percent of normal, will be dependent a little more upon imported supplies which are expected to be slightly above normal.

The snowpack on the Columbia and Kootenai rivers in British Columbia is very light, according to the British Columbia Department of Lands, Forests and Water Resources. Within the Province the snow varies from a low of 62 percent on the lower Columbia drainage to 73 percent on the upper Columbia, near 65 percent on the Kootenai and 81 percent on the Okanogan-Similkameen. Since this is a water rich area no irrigation shortages are anticipated. Principal impact of the lower than normal streamflow will be felt in the power reservoirs.

Below normal streamflow is also expected in northwestern Montana, northern Idaho and most of central and western Oregon. Near 70 to 90 percent of average flows are expected here. Reservoir storage is generally good in these areas, assuring adequate supplemental water supplies to offset the below normal streamflow.

Areas where above to much above normal streamflow (110 to 140 percent) is anticipated include the North and South Platte rivers of Wyoming and Colorado, the Judith and Musselshell rivers in Montana, most streams of eastern Oregon and southwest Idaho, the Sacramento river in California, streams of central Utah and the lower Humboldt in Nevada. Some smaller areas are also included such as the Tongue and Little Big Horn rivers of Wyoming and Montana, the Salt, Greys and Smith Fork Bear rivers in Wyoming and the main stem upper Colorado river in Colorado.

Snow cover in Arizona and New Mexico was practically gone from many watersheds by the end of February. Most Arizona streams should yield from about 25 to 50 percent of average runoff. In New Mexico, stream forecasts range from about 60 to 65 percent average. From 50 to 75 percent of average streamflow is expected from the Upper Rio Grande and San Juan rivers of Colorado, the Virgin and Upper Sevier rivers in Utah and streams in central and southern

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS MARCH 1, 1970

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	53	85
Madison	66	96
Gallatin	114	131
Missouri Main Stem	82	105
Yellowstone	102	116
Shoshone	83	93
Wind	77	85
North Platte	119	131
South Platte	166	146
ARKANSAS BASIN		
Arkansas	128	124
Canadian	---	---
RIO GRANDE BASIN		
Rio Grande (Colo.)	54	66
Rio Grande abv. Otowi Bridge	39	45
Pecos	6	6
COLORADO BASIN		
Green (Wyo.)	83	103
Yampa - White	95	107
Duchesne	43	80
Price	51	96
Upper Colorado	123	138
Gunnison	81	107
San Juan	47	67
Dolores	59	98
Virgin	15	45
Gila	2	2
Salt	13	19
GREAT BASIN		
Bear	72	98
Logan	87	102
Ogden	60	100
Weber	59	98
Provo - Utah Lake	49	89
Jordan	69	109
Sevier	34	73
Walker - Carson	47	101
Tahoe - Truckee	47	100
Humboldt	57	115
Lake Co. (Oregon)	35	60
Harney Basin (Oregon)	69	116
UPPER COLUMBIA BASIN		
Columbia (Canada)	68	67
Kootenai	65	76
Clark Fork	71	86
Bitterroot	76	88
Flathead	80	94
Spokane	75	90
Okanogan	72	86
Methow	64	98
Chelan	67	73
Wenatchee	77	141

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	88	104
Snake above Hiese, Idaho	87	106
Snake abv. American Falls Res.	70	105
Henry's Fork	71	101
Southern Idaho Tributaries	90	127
Big and Little Wood	55	95
Boise	67	114
Owyhee	50	114
Payette	81	120
Malheur	79	125
Weiser	90	131
Burnt	102	135
Powder	105	123
Salmon	71	98
Grande Ronde	66	79
Clearwater	75	85
LOWER COLUMBIA BASIN		
Yakima	89	131
Umatilla	44	87
John Day	107	134
Deschutes - Crooked	60	80
Hood	51	96
Willamette	45	63
Lewis	50	78
Cowlitz	63	87
PACIFIC COASTAL BASIN		
Puget Sound	60	80
Olympic Peninsula	56	82
Umpqua - Rogue	35	64
Klamath	39	65
Trinity	60	115
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	70	95
Feather	60	100
Yuba	45	75
American	50	90
Mokelumne	45	80
Stanislaus	40	85
Tuolumne	40	80
Merced	30	70
San Joaquin	35	75
Kings	25	75
Kaweah	25	65
Tule	25	60
Kern	25	75

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1953-67 *period.* California averages are for the period 1931-65.
Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

Nevada. Fortunately, where reservoirs are available in these areas the present storage is excellent. However, where no reservoirs are available on smaller streams there will be definite water shortages experienced this summer.

Storage in the principal irrigation reservoirs is near average or above in all states of the west except Washington.

MISSOURI BASIN

The mountain snowpack on the upper Missouri river and its tributaries in Montana continues to show considerable variability. It varies from 15 percent below average in the Jefferson and Marias-Sun river drainages to 30-35 percent above average in the Gallatin and Judith-Musselshell drainages. Along the main stem, snow on the west side of the Missouri is well below average, while on the east side it is well above average. Near average conditions exist along the Madison river.

Snow cover on the Yellowstone river is about 15 percent above average in Montana, decreasing to about 10 to 15 percent below average near its headwaters in Yellowstone Park. The Shoshone and Wind rivers also have about 10 to 15 percent below average snow cover. In the Big Horn mountains conditions vary from near to well above average with the heaviest cover on the north and east slopes.

Although snow cover in southern Wyoming and northern Colorado failed to show a normal increase for February, reflecting the dry, warm conditions that have prevailed, the snow is still well above average. The North Platte and Laramie rivers show about 130 percent normal, while the South Platte in Colorado recorded about 145 percent.

Moisture in the soils underlying the snowpack continues below average in Montana and Wyoming. The soils in Colorado have an average or better moisture condition.

Flow of streams in Montana is expected to be 20 to 30 percent less than average for streams originating west of the upper Missouri river. The outlook improves somewhat in the Jefferson drainage where streamflow is expected to be from 10 to 20 percent below average. Near average flows are forecast for the Madison, Missouri, Milk, St. Mary and Yellowstone rivers. Well above average runoff can be expected in the Gallatin, Judith, Musselshell and Smith river drainages.

In Wyoming the flow of the Shoshone, Wind, Big Horn and Sweetwater rivers is anticipated to be about average to 5 percent less than average. Streams on the north and east slope of the Big Horn mountains show better prospects, as indicated by the Tongue and North Fork Powder rivers. These are forecast at 120 and 115 percent, respectively. Flows of 130 to 140 percent of average are expected from the North Platte and Laramie rivers, as well as from most tributaries of the South Platte in Colorado.

Carryover reservoir storage is near normal in Montana, a little below average on the North Platte and Wind rivers in Wyoming, and above average in the reservoirs of the South Platte river system.

ARKANSAS BASIN

In spite of the dry, warm February weather, the main headwaters of the Arkansas river continue to have an above normal snowpack. However, the snow and water outlook falls off on its southern tributaries and in New Mexico on the Canadian river. Warm temperatures and intense solar radiation have eaten away much of the snow on south facing slopes. Low elevation snows have disappeared.

At Salida the Arkansas river is now expected to supply an adequate, but slightly less than average amount of water. The Purgatoire and Cucharas rivers should also yield near, but below average flows (near 10 to 15 percent below normal). Soil moisture is reported normal or better in both mountain and irrigated areas.

Storage in John Martin reservoir is 13 percent of capacity, less than the 24 percent of capacity it ordinarily holds this time of year. In New Mexico storage is considerably better in Conchas reservoir on the Canadian river. Conchas now holds 85 percent of its capacity compared to the average condition of being 60 percent full.

RIO GRANDE BASIN

The snowpack is very deficient on all watersheds of the Rio Grande basin. It is about two-thirds normal on the upper headwaters in Colorado, decreasing sharply to less than half normal to the south. On the Pecos river in New Mexico the snowpack is essentially gone - only 6 percent of average. Many snow courses show less snow now than they had a month ago.

Soil moisture in the middle and southern portions of the basin is reported as fair. It is good in northern sections.

Flow of the Rio Grande near Del Norte is expected to be about three-fourths average. Prospects for inflow to the river system are very poor from the Conejos and Chama rivers. Current outlook for these tributaries is for about 60 to 65 percent of average flows, with total flow of the Rio Grande at Otowi Bridge forecast at 58 percent. Outlook for the Pecos

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) APRIL - SEPTEMBER as of MARCH 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
UPPER MISSOURI			
Jefferson at Sappington, Montana	790	83	
Madison near Grayling, Montana 1/	430	100	573
Gallatin near Gateway, Montana	555	120	
Missouri near Landusky, Montana 2/	4300	96	
Sun at Gibson Dam, Montana 3/	495	80	509
Marias near Shelby, Montana 4/	450	75	476
Milk near Eastern Crossing Montana	280	100	
Yellowstone at Yellowstone Lake Outlet, Wyo. (Apr-Oct.)	795	95	
Yellowstone at Corwin Springs, Montana	1900	101	
Clark Fork at Chance, Montana	580	100	
Shoshone, Inflow to Buffalo Bill Res., Wyo.	770	95	
Wind at Dubois, Wyoming	99	100	
Boysen Reservoir Inflow, Wyo.	714	96	
Bull Lake near Lenore, Wyoming	170	95	
Tensleep near Tensleep, Wyoming	70	95	
Yellowstone at Miles City, Montana 5/	6020	103	
Missouri near Williston, N. Dakota 6/	10770	98	
PLATTE			
North Platte at Saratoga, Wyoming	773	139	
Laramie near Jelm, Wyoming 7/	149	143	
Clear at Golden, Colorado	160	134	
St. Vrain at Lyons, Colorado	95	136	
Cache LaPoudre near Fort Collins, Colorado 8/	250	116	
ARKANSAS			
Arkansas at Salida, Colorado 9/	290	94	
Purgatoire at Trinidad, Colorado	40	87	
RIO GRANDE			
Rio Grande near Del Norte, Colorado 10/	320	73	
Conejos near Mogote, Colorado 11/	115	63	
El Vado Res. Inflow, New Mex.	120	64	
Rio Grande at Otowi Bridge, New Mexico 12/	300	58	
Pecos at Pecos, New Mexico *	24	59	
UPPER COLORADO			
Granby Reservoir Inflow, Colorado 13/	225	103	
Colorado at Dotsero, Colorado 14/	1400	102	
Roaring Fork at Glenwood Springs, Colorado 15/	650	93	
Gunnison at Grand Junction, Colorado 16/	1000	87	
Dolores at Dolores, Colorado	180	78	
Colorado near Cisco, Utah 16/ **	2495	89	3359
Flaming Gorge Res., Utah, Net Inflow 17/ **	1025	97	1273
Yampa at Steamboat Springs, Colorado	295	113	
Yampa near Maybell, Colorado	900	105	
Little Snake nr. Dixon, Wyoming	363	140	
White near Meeker, Colorado	300	102	
Duchesne near Tabiona, Utah 18/ **	91	97	138
Whiterocks near Whiterocks, Utah **	41	80	73
Scofield Reservoir, Utah, Net Inflow 19/ **	32	100	60
Green at Green River, Utah 17/ **	2690	104	3404
Navajo Reservoir Inflow, New Mexico **	420	68	897
Animas at Durango, Colorado	320	78	
San Juan near Bluff, Utah 20/ **	595	67	1373
Colorado, Inflow to Lake Powell, Arizona 21/ **	6005	92	8162
LOWER COLORADO			
Gila near Solomon, Arizona (March-May)	34	47	32
Salt at Intake, Arizona (March-May)	75	37	276
Verde above Horseshoe Dam, Arizona (March-May)	65	61	172

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) APRIL-SEPTEMBER as of MARCH 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
GREAT BASIN			
Bear at Harer, Idaho	200	88	319
Logan near Logan, Utah 22/ **	99	100	111
Ogden, Inflow to Pine View Res., Utah 23/ **	92	98	155
Weber near Oakley, Utah **	100	92	146
Utah Lake, Utah, Net Inflow **	217	111	263
Big Cottonwood near Salt Lake City, Utah **	35	103	44
Beaver near Beaver, Utah **	22	116	36
Sevier near Hatch, Utah **	22	67	107
Sevier near Gunnison, Utah **	42	135	109
Humboldt at Palisades, Nevada **	200	130	363
Truckee at Farad, California 26/ **	255	99	557
East Carson near Gardnerville, Nevada **	179	102	394
West Walker near Coleville, California **	160	112	295
UPPER COLUMBIA			
Kootenai at Libby, Montana	6500	81	9168
Kootenai at Leonia, Idaho	7320	80	10672
Blackfoot near Bonner, Montana	850	84	1079
Flathead near Columbia Falls, Montana 27/	5630	87	5744
Flathead near Polson, Montana 27/	6570	85	7296
Clark Fork above Missoula, Montana	1490	85	1968
Bitterroot near Darby, Montana	480	86	566
Clark Fork at Plains, Montana 27/	10485	84	12388
Columbia at Birchbank, British Columbia 27/	38500	81	49744
Spokane at Post Falls, Idaho 28/	2500	80	3440
Columbia at Grand Coulee, Washington 27/	58250	54	74687
Okanogan near Tonasket, Washington	1530	88	
Chelan at Chelan, Washington 29/	1140	90	
Wenatchee at Peshastin, Washington	1650	91	
SNAKE			
Snake above Palisades Res., Wyoming 30/	2500	98	
Grey's above Palisade	424	117	
Salt above Palisade	370	115	
Snake near Heise, Idaho 30/	3800	102	3685
Henry's Fork near Rexburg, Idaho 31/	1230	100	
Teton near St. Anthony	410	104	
Big Lost near Mackay, Idaho 32/	150	89	284
Big Wood, Inflow to Magic Res., Idaho 33/(March-July)	300	112	625
Bruneau near Hot Springs, Idaho (March-September)	235	123	274
Owyhee Res., Net Inflow, Oregon	360	120	741
Boise near Boise, Idaho 34/	1800	116	1987
Malheur near Drewsey, Oregon	99	138	
Payette near Horseshoe Bend, Idaho 35/	2100	114	2086
Weiser above Crane Creek (March-September)	580	115	
Snake at Weiser, Idaho	7100	113	
Salmon at Whitebird, Idaho	7000	102	7230
Clearwater at Spalding, Idaho	8000	93	8380
LOWER COLUMBIA			
Grande Ronde at LaGrande, Oregon	130	74	227
Yakima at Cle Elum, Washington 36/	900	93	
Deschutes at Benham Falls, Oregon 37/	500	84	514
Columbia at The Dalles, Oregon 27/	93200	88	108959
Hood near Hood River, Oregon 37/	308	92	
Willamette at Salem, Oregon 37/	4570	88	
Lewis at Ariel, Washington 38/	1360	100	
Cowlitz at Castle Rock, Washington	2530	90	

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) APRIL - SEPTEMBER as of MARCH 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
NORTH PACIFIC COASTAL			
Dungeness near Sequim, Washington	145	84	
Rogue at Raygold, Oregon	831	88	1003
Klamath Lake, Net Inflow, Oregon	480	83	656
CALIFORNIA CENTRAL VALLEY 39/ **			
Sacramento, Inflow to Shasta, California	2100	120	2588
Feather near Oroville, California	1800	97	3307
Yuba at Smartville, California	1000	92	1748
American, Inflow to Folsom Res., Calif.	1300	98	2191
Cosumnes at Michigan Bar, California	120	94	230
Mokelumne, Inflow to Pardee Res., Calif.	470	101	882
Stanislaus, Inflow to Melones Res., Calif.	660	93	1392
Tuolumne, Inflow to Don Pedro Res., Calif.	1170	99	2405
Merced, Inflow to Exchequer Res., Calif.	580	97	1379
San Joaquin, Inflow to Millerton Lake, Calif.	1130	96	2898
Kings, Inflow to Pine Flat Res., California	1020	89	3163
Kaweah, Inflow to Terminus Res., California	180	69	807
Tule, Inflow to Success Res., California	40	71	222
Kern, Inflow to Isabella Res., California	390	95	1649

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California. California is computed for 1916-65.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts Listed on Inside Back Cover.
* April - June Period ** April - July Period.

river is essentially the same, with a forecast of 59 percent at Pecos.

Snowfall must be much above normal during March or very short water supplies can be expected in all areas dependent on natural streamflow. Fortunately, reservoir storage is good and will provide a good supplement to streamflow. However, heavy draft of the reservoirs will be required, with poorer carryover remaining for next year.

COLORADO BASIN

Dry, warm weather during February has reduced the prospects for next summer's streamflow. The present snowpack in the Upper Colorado river basin varies from about one-half average on southern Utah's smaller tributaries and two-thirds average on the San Juan river, to essentially average amounts on the upper Green river in Wyoming, the Yampa, White, Gunnison and Dolores rivers in Colorado. The snow on watersheds of northern Utah's tributary streams varies from about average to 20 percent less than average. The upper Colorado river snowpack remains the most favorable with 138 percent.

Despite the lowered streamflow outlook, most of the Upper Colorado basin still has prospects of adequate water supplies next summer. Short supplies during late summer can be expected along the San Juan river and in southern Utah by those water users who are on natural flow rights or where reservoir storage is limited.

Storage in most irrigation reservoirs is still considerably above average. Storage in Lake Powell and other major reservoirs in the upper basin is 39 percent of capacity and 2,208,770 acre-feet more than last year at this time. Storage in Lake Mead is also up, with approximately 1,390,000 acre-feet more than in 1969. Snowmelt season inflow to Lake Powell (April-July period) is forecast at 92 percent of average.

Water supplies in Arizona will be adequate on all projects served by stored water, since reservoir storage is above average. Considerable pumping will be required along the Upper Gila river and on the San Carlos Project to supplement the very low streamflow anticipated.

Due to the light snowpack at the end of February - virtually zero on the Verde and Gila watersheds, 13 percent average on the Salt river and 25 percent on the Little Colorado - most Arizona streams are expected to yield between about 25 to 50 percent of

average runoff. These forecasts include the effect of the heavy storm that hit the first few days of March.

The Salt River Project reservoirs, presently containing 71 percent of capacity, are 36 percent above average for this date. San Carlos and Lake Pleasant are 62 and 71 percent above average, respectively. The Colorado river reservoirs contain 53 percent above the average amount of water.

Southern Nevada's snowpack is very deficient. Measurements made near Las Vegas indicate that in only three years during the last 30 has there been less snow on March 1st.

GREAT BASIN

Despite a dry, warm February, the snowpack lying on the major watersheds of the Great Basin continues to be in a near or above average condition. This, combined with well above average reservoir storage supplies, provides a good water supply outlook for the coming season.

The water outlook is less favorable for some of the smaller watersheds in central and southern Nevada and southern Utah. Snow surveys in the Austin area of Nevada and on the upper Sevier river in Utah reveal a snowpack of about one-fourth to one-half average, while streams of White Pine County, Nevada hold a snowpack near three-fourths normal. Late summer water shortages are anticipated in these areas.

Throughout the Basin the snowpack is more favorable at the high elevations, with snows at the lower elevations reflecting the dry weather and early melt conditions of February. In the Humboldt river basin the snowpack at the lower levels varies from one-third less than normal down to virtually nothing. Fortunately the higher elevation snows are sufficient to indicate near average to above average streamflow for the Humboldt and its major tributaries. Storage in Rye Patch reservoir, which is now at 97 percent of capacity and 234 percent of average, adds to the favorable outlook for the Humboldt.

While snow cover is exceptionally light on the upper Sevier river (above Piute and Otter Creek reservoirs), this unfavorable condition is largely offset for the middle and lower Sevier river by average or above snowpacks on their tributary watersheds, by above average base flows in the river and excellent reservoir storage. Streamflow forecasts for the middle and lower Sevier, including tributaries, ranges from about average to 135 percent average. Combined storage in the Sevier river reservoirs is 249 percent of the March 1st average (1953-67 period). Late summer shortages are anticipated on the upper Sevier, where streamflow forecasts range from about 60 to 70 percent.

The snowpack in the Tahoe-Truckee and Carson river drainages is less than average for elevations below 7,000 feet, but above normal at the higher elevations. Reservoir storage remains excellent for these watersheds (130 to 160 percent). This excellent storage, plus near average streamflow predicted for this summer assures good water supplies. Outlook for the Walker river basin is similar, with 140 percent average reservoir storage and prospects for slightly above normal streamflow.

The water supply outlook remains good for water users served by streams of central and northern Utah that drain into Great Salt Lake. Most of these streams are forecast to yield within about 10 percent of usual amounts. A small area east and north of Salt Lake City has a well above normal snowpack which indicates streamflows will be in the range of 120 to 140 percent average. Streams included are Parleys, East Canyon, Hardscrabble and Farmington Creeks.

The Bear river in Wyoming, Idaho and Utah, along with most of its tributaries is forecast to yield from near 85 percent to average flows. Smith's Fork near Border, Wyoming is high with a forecast of 116 percent. Reservoir storage along the Bear river, as well as on other streams of northern Utah is excellent.

COLUMBIA BASIN

Dry, warm February weather reduced prospects for next spring and summer's snowmelt runoff. While near 10 to 25 percent less than normal runoff is anticipated for much of British Columbia, northwest Montana, northern Idaho, central and western Oregon, no major water shortages are anticipated as yet. Reservoir storage is generally very favorable and will furnish adequate supplemental water supplies for most uses. Some late summer shortages may be experienced by water users dependent on natural streamflow.

Snowpack accumulation during February was generally much below normal throughout most of the basin. Warm temperatures during February-making four consecutive months of above normal temperatures-have removed a considerable amount of low elevation snow.

The watersheds of the upper Columbia and Kootenai rivers in British Columbia continue as the largest area of below normal snowpack. This entire area averages near 65 percent of the usual amount. The upper Willamette river of Oregon is also included in the light snow category. A near three-fourths normal snowpack is found on watersheds of Chelan Lake, Kettle river and the Kootenai river in Montana. Snow cover continues well above normal (120 to 140

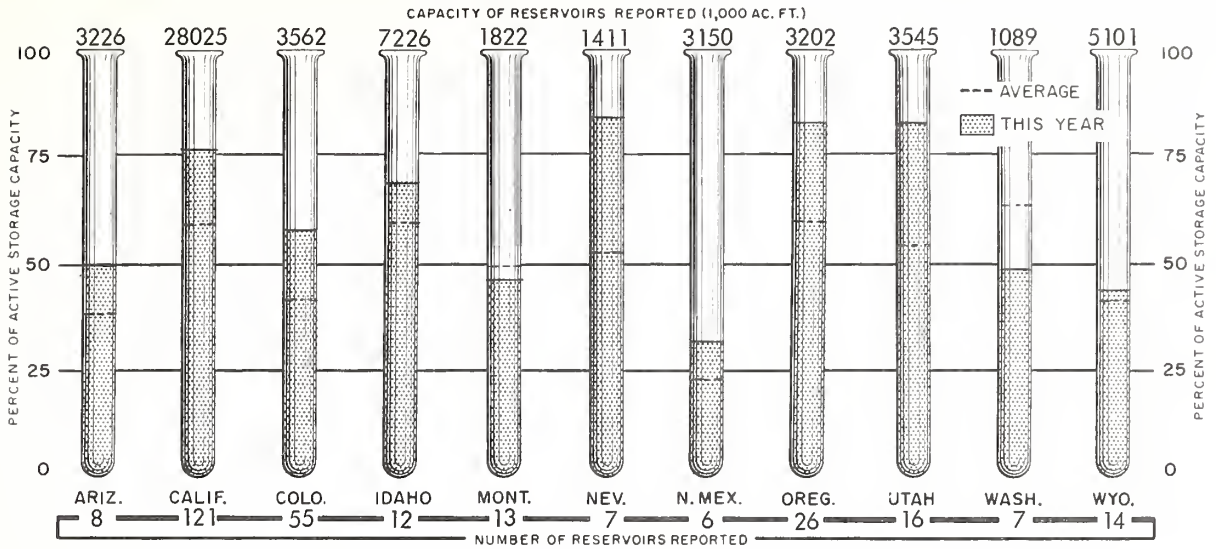
STORAGE IN LARGE RESERVOIRS MARCH 1, 1970

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Belle Fourche	185	97
Boysen	550	297
Buffalo Bill	373	140
Canyon Ferry	2043	1632
Fort Peck	19140	16050
Garrison	24500	18522
Hebgen	377	266
Keyhole	192	114
Lake Francis Case	5816	3566
Lake Sharp	1900	1725
Oahe	23630	19368
Tiber	1347	527
Yellowtail	1356	696
PLATTE		
City of Denver (5)	507	468
Colo-Big Thompson (3)	718	449
Glendo	784	373
Pathfinder	1016	298
Seminoe	1010	313
ARKANSAS		
Conchas	273	232
John Martin	354	47
RIO GRANDE		
Elephant Butte	2195	575
El Vado	195	1
UPPER COLORADO		
Blue Mesa	830	994
Flaming Gorge	3749	1487
Navajo	1696	925
Powell	25002	9439
LOWER COLORADO		
Havusu	619	553
Mead	26159	16854
Mohave	1810	1613
Salt River Res. (4)	1755	1259
San Carlos	985	180
Verde River Res. (2)	318	102
GREAT BASIN		
Bear	1421	1135
Lahontan	286	249
Rye Patch	179	173
Sevier Bridge	236	224
Strawberry	274	193
Tahoe	732	646
Utah	884	870
Willard Bay	193	119

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	97
Coeur d'Alene	225	162
Duncan	1347	82
Flathead	1791	909
Hungry Horse	3428	2038
Kootenay	673	296
Lower Arrow	3083	0
Noxon Rapids	335	314
Pend Oreille	1155	550
Roosevelt	5232	3465
Upper Arrow	4061	0
LOWER COLUMBIA		
Cougar	155	52
Detroit	300	133
Hills Creek	200	95
Lookout Point	337	128
Yakima Res. (5)	1066	497
SNAKE		
American Falls	1700	1446
Anderson Ranch	423	278
Arrowrock	287	278
Brownlee	980	478
Cascade	653	315
Jackson	847	627
Lucky Peak	278	72
Owyhee	715	673
Palisades	1200	925
PACIFIC COASTAL		
Clair Engle	2448	2445
Clear Lake	440	352
Nacimiento	350	100
Ross	1203	725
Upper Klamath	584	486
CALIFORNIA CENTRAL VALLEY		
Almanor	1036	915
Berryessa	1602	1606
Folsom	1010	620
Isabella	570	257
McClure	1026	669
Millerton	521	387
Oroville	3484	2790
Pine Flat	1013	770
Shasta	4500	3409

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

RESERVOIR STORAGE as of MARCH 1, 1970



percent) in the Yakima-Wenatchee area of Washington, east central Oregon with adjacent watersheds in Idaho, and on the smaller southern tributaries to the middle Snake river.

Throughout the rest of the basin the snowpack varies from about average to 20 percent less than average, except on the Boise, Owyhee and Priest rivers where it is about 115 percent. On the upper Snake river in Wyoming it is about 5 percent above average.

Soil moisture under the higher elevation snowpacks continues generally below average. At lower elevations soils are well saturated from early snowmelt. Any rains which occur in the near future should result in a high yield. However, a contination of the warm, dry conditions of February will quickly dry out these lower soils, resulting in a lower water yield from April and May rains.

Most streams in Montana are forecast to yield 80 to 85 percent of their average snowmelt runoff. Smaller streams with low elevation headwater areas will yield less, or about in the 60 to 75 percent range. In Idaho, about 10 to 20 percent less than average flows are forecast for the Spokane, Clark Fork and Lost rivers. Forecasts for the Clearwater, Salmon, Priest and upper Snake river streams and their tributaries are in the 90 to 110 percent range. The middle and lower Snake river tributaries have very favorable prospects, with forecasts generally ranging from 110 to 130 percent normal.

Streams in Oregon where prospects are favorable include the Owyhee, Malheur, Silvies, Burnt, Powder and upper John Day rivers. Forecasts for these streams range from about 115 to 140 percent of average. Within 10 percent of average flows are expected from the upper Deschutes-Crooked rivers, the lower Grande Ronde and streams in the Mt. Hood area. Other streams in the state are forecast at near 75 to 90 percent.

In Washington the water supply outlook for irrigation and power is considered to be generally adequate. Reservoirs generally have below normal storage for this time of year, but storage is expected to be sufficient to meet requirements if subsequent spring precipitation is normal. Anticipated flow of most streams is now in the 85 percent to normal category.

ALASKA

Snow cover is considerably below normal throughout most of interior Alaska, including the watersheds of the Tanana, Chena, Kuskokwim, Upper Yukon and Koyukuk rivers. The Copper and Susitna river basins south of the Alaska range also have a snowpack far below average.

At high elevations in the Kenai Mountains, portions of the Chugach Mountains, and in Southeast Alaska snow cover is considered as above normal. Warm temperatures early in the winter caused much of the precipitation at lower elevations to fall as rain. Snowpack is less than average at these lower levels.

Soils in the major portion of the state are dry. It is expected that much of the spring snowmelt will be absorbed by the dry soil and runoff will be light in the entire area north of the Chugach Mountains.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that, despite much below normal precipitation during February, forecasts of April-July runoff, although down 15 percent from that reported

one month ago, are still indicating near or above normal streamflow for most snowmelt watersheds in California. Thus, with the above normal reservoir storage for this date, water users in most areas are assured of near or above normal water supplies. Although Southern California's local runoff is still below normal, storage data and forecasts of runoff from sources of import indicate near or above normal supplies will be available this year.

California was dominated by a dry and warm weather regime during February with temperature departures ranging from 1 to 8 degrees above normal. Precipitation over the State was light, averaging 55 percent of normal for the month. Except for the Colorado Desert area at 160 percent of normal, the South Coastal area (75 percent) experienced the greatest precipitation percentage-wise during February. The first general storm, lasting 4 days, started on the 11th and lasted through the 14th, producing only moderate amounts. Following a clear day, the second storm embraced most of Northern and Central California. Again, reported storm totals were light to moderate in value. A moderate to heavy storm system became entrenched over the State on the last day of the month and persisted through the first days of March. Precipitation to date ranges from normal to well above in the northern half of the State but is generally less than 50 percent of normal to the south. Statewide, the seasonal precipitation to date is 120 percent of normal.

Snow surveys made on or about March 1 at 185 snow courses and reports from 21 snow sensors show that the water content for Cascade and Sierra watersheds was 85 percent of normal for this date and 80 percent of the April 1 average. Generally, the snowpack varied from a high of 110 percent of normal in the Trinity River watersheds to a low of 70 percent in the Kern River Basin. As last month, the snowpack is significantly better in the higher elevation watersheds where it escaped the deteriorating effect of the warm January rains and springlike weather of February. Many streams up to the 9,000 foot level remained open through the month.

Central Valley streamflow forecasts for the April-July period, assuming normal precipitation during the remainder of the season, are down as much as 15 percent from those reported one month ago. These forecasts indicate that runoff from snowmelt tributaries will be about 100 percent of normal. The Sacramento and San Joaquin Valleys will average 105 and 95 percent of normal, respectively. Watersheds draining from higher elevation areas show the greater potential runoff, having been effected the least from the warm rains of January and the above normal temperature regime of February. Water year forecasts for California streams are 145 percent of average. Central and South Coastal areas, at 85 and 80 percent, respectively, are now the only areas forecasted to experience below normal runoff this water year.

Statewide, unimpaired runoff of California's major streams during February was about average. Above normal runoff was experienced only in the Central Valley and Lahontan areas at 110 and 165 percent, respectively. These were the areas most affected by the heavy storms of January. Unimpaired runoff for the period October 1 to date was 210 percent of normal, ranging from 225 percent of average for the Central Valley area to 50 percent of average for the South Coastal area.

The aggregate storage on March 1 in 121 major reservoirs in California, with a combined capacity of 28,025,000 acre-feet, was 21,257,000 acre-feet. This represents 125 percent of their average storage for this date and 76 percent of their capacity. There has been a net increase of 2,310,000 acre-feet during the past year, 750,000 acre-feet of which represents additional storage provided by the New Bullards Bar reservoir of the Yuba County Water Agency.

EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).

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